View metadata, citation and similar papers at core.ac.uk
brought to you by CORE
provided by Ecoforum Journal (University of Suceava, Romania)

[Volume 7, Issue 1(14), 2018]

ESTIMATION OF UNDERGROUND ECONOMY IN NORTH CYPRUS: NEW RESULTS WITH MIMIC MODEL APPROACH AND BRIEF MODEL COMPARISONS

Hasret Benar BALCIOGLU
Cyprus International University, North Cyprus, Mersin 10 Turkey
hbenar@ciu.edu.tr

Abstract

This study measures the informal economy of North Cyprus (NC) by using the MIMIC Model Approach. The data, picked up from the website of the North Cyprus State Planning Organization, start from 1977 and go to 2015. Because North Cyprus is a small island, the applicability of different models are discussed and compared. As a conclusion, dynamic MIMIC Model approach has been found to be the most efficient model and the results obtained by using Lisrel 8.7 indicate that if there is an increase in unemployment rate, inflation rate, per capita electricity consumption, total tax revenue ratio, and the number of self-employed people, the informal economy responds to the increase as a rise. On the other hand, there is a negative relationship between the growth rate of employment and real GNP and the informal economy.

Key words: *Informal Economy; Lisrel 8.7; MIMIC Model; Model Comparisons; North Cyprus*

JEL Classification: *H24; H61; H30*

I. INTRODUCTION

Illegal economic activity is defined as the underground economy. Transactions are illegal because the good or service being traded is itself not legal or because transactions do not comply with government reporting requirements. The first category includes drugs and prostitution in most jurisdictions. The second includes untaxed labor and sales, as well as smuggling goods to avoid duties. The shadow economy, black market and informal economy are referred to the underground economy.

The problems created by informal economy began to be debated in the developed Western economies in 1960s, in the United States in the 1970s, and they have been brought to light in Turkey in the 1990s. When it is looked at North Cyprus, it seems that recently solutions to the problem are investigated. The rise in the informal economy causes increases in tax losses, public budget deficits and deterioration of the social security system. At the same time, economic forecasts are also deviating. It is not easy to gauge the size of underground economies, because they are by nature not subject to government oversight and do not generate tax returns and can not be found in official statistics. However, discrepancies in these statistics can show the approximate size of informal economies. For example, in practice, expenditures exceed income, because income from an illegal transaction will not appear in the data, but that money will show up in expenditures when it is used in a legal transaction. Along the same lines, if the growth rate of GDP is less than the growth rate of electricity consumption, it is thought that the underground economy is growing at the formal economy's expense.

While it is not easy to measure the informal economy, several approaches have been exhibited in the process. The methods are used under two basic headings; directly and indirectly. Three different approaches are used, namely production, income and expenditure methods, in the context of income and expenditure. When there is no informal economy, there is no difference in the Gross National Product (GNP) calculations in the calculations made with all three approaches. It is expected that the GNP calculations made by means of spending in the informal economy are bigger than the calculations made with other approaches and that the figure found by income management is expected to be the lowest (Sarılı, 2005). This approach, known as the income-expenditure disparity, is based on the assumption that employees will not be able to conceal their incomes from the informal economy (Prokhorov, 2001).

II. SPECIFIC MEASUREMENT MODELS AND LITERATURE REVIEW

Informal Economy with Micro Speed Measurement Model

With the data obtained by the random selection method, the volume of hidden economic activities is determined. Such data are obtained through questionnaires. Surveys can be conducted with income sources so that the informal economy can be measured directly. Banks, statistical agencies, tax administrations (Gerxhani, 2004, and Loayza et al., 2005) and private research and survey organizations preferably use this model (Gutmann, 1977). Since the questionnaires are based on information to be given to the persons, reliability is

questioned. It could be clearly understood from the expenditure whether people show their income correctly or not, especially from the expenditure on food.

Income-Expense Model in Measuring Informal Economy

According to the work done by Endström and Holmlund (2007), it is easier to de-register the income of the employers as compared to the enterprises that are self-employed. In this study, Sweden is examined as a country and the level of incomes that are not recorded in its own employers are investigated. According to the hypothesis written in the article, the incomes of those who work at their own workplace can show up in food expenditures. According to the work done, business owners show their own income by 30%. Especially for those who have acquired legal personality, business owners are saving less of their income than those who can not acquire legal personality.

According to a microeconomic study done by Tedds in 2005, a variable is defined by the obstacle curve for the income shown by the household. Afterwards, a parameter which is not based on the groom is defined. The model allows a model to change the number of households and to work correctly with different incomes. The study finds that Canada's products and services are tax-exempt, and their incomes are low.

Pissarides and Weber (1989) calculate the UK's unregistered economy using the income and expenditure approach and the data from the Family Expenditure Survey. The study involved hypotheses that everyone correctly spends on food, that employees correctly explain their income, and that employers are low-income sources. As a result of equations based on food expenditures made, the actual incomes of the employers are 1.5 times the income they declare. According to the findings, it is concluded that the informal economy is 5.5% of GDP. Krichevskiy (2010) showed that business owners have lowered their incomes and thus kept their income-based premiums higher. Statistics based on expenditure have achieved relevant results in the light of information. According to Kim, Gibson and Chung's article written in 2011, employers have constantly different opinions about how they misrepresent their income but how this misrepresentation of income is diverted. Relevant study based on the model they established in Pissarides and Weber (1989), the low-income record is based on differences between the revenues explained by employer food expenditures. Analyzes with the help of the modeled panel data approach also reveal the differences between low declared income and temporarily earned income. This relevant study shows that employers do not declare 20% of their income, as it is done for Korea and Russia.

Lyssiotou, Pashardes and Stengos (1999) used parametric and nonparametric approaches to show that employers in England have shown a low income in their work. Here, employers are categorized at the level of income they declare, and they also prevent misdiagnosis, which may occur under the influence of residence. Sookram and Watson (2007) show that employers do not record their income in Trinidad and Tobago which indicates why the regulations that the state describes as repressive are burdensome. In this study, 1027 small enterprises were surveyed.

Gabor (1989) has done a study that examines the informal economy in Hungary. He argued that the basic principle between the registered economy and the informal economy arises from differences in regulations. While central authority management and large-scale units constitute registered economies, in the informal economy the enterprises are private and small scaled. The registered sector can not meet the demand sufficiently. In an environment with chronic shortages and unregistered economy on the registered economy that does not compete with free market conditions, it creates cost pressures. Us (2004) used the income-expenditure approach in the informal economy calculations for the Turkish economy. When the unregistered economy is calculated in Turkey, the value for the informal economy for the period of 1987-1990 is negative when considering the difference between the GDP calculated on the expenditure side and the GDP calculated on the income side. In the calculations made for the other periods, it is seen that the unregistered economy supports the positive increase with the steady increase.

In economies with high dollar circulation and gold saving, it is known that the income-expenditure approach is not reliable in determining the size of the informal economy. According to Us (2004), when the trend of the DTH / M2Y ratio, which is accepted as the basis for finding the dollarization lower limit, was examined, it was understood that there was a demand of around 30% in the period of 1987-2003 and it put pressure on the spending-related GDP value. In other examinations made with the Revenue-Expenditure approach, seasonal effects were found to be significant at 3-month GDP. It has been noticed that different results are obtained when the seasonal effects are removed by TRAMO-SEATS method.

Revenue-Expense Model for Measuring Underground Economy

Due to the fact that when small enterprises are concentrated in the industry, the informal economy orientation can also be found by the related Sookram and Watson (2007) model. The best income-expenditure method that can be used to calculate the informal economy is Smith et al.'s (1986) and Pissarides and Weber's (1989). In this approach, employees are divided into self-employed and salaried employees. They write the following equation for workers on their own behalf with equality in log-log form (on expenditures and incomes).

$y^*_{SE}=\Theta y_{SE}$,
where,
y^*_{SE}:: real revenues of self-employed
y_{SE}: self-declared income of employees
$\Theta > 1$

n being the first place, the expenditure function of the employees in the provision of cash is calculated. Then Θ is computed together with the spending function of self-employed workers.

MIMIC Model for Informal Economy

The MIMIC Model is based on the statistical theory of hidden variables which consists of many model and indicator variables. The relevant model uses statistical modeling, taking into account hidden variable size in closed economies. In short, a time series model of MIMIC Model is seen as a prediction model in the international arena. In other words, it focuses on the number of observable economic conditions that determine the level of informal activities with a set of observable multiple indicators. Especially in social studies, it is used in studying hidden variables.

It is a special case of the general Linear Independent Structural Relationship (LISREL) Model with Multiplex Indicators and Multiple Causes (MIMIC) Model. This model is developed to predict when the dependent variable is unknown. The MIMIC model consists of two parts, the measurement model and the structural model. The measurement model linking the hidden variables to the observed indicator variables and the relationship between the causal variables and the unobserved variables are structural models.

The MIMIC model (Lee, 2005, Giles 1999, Tedds 1999, Breusch, 2005) has been differentiated from the Lisrel Model as follows.

$\eta=\Gamma x+\zeta$

$\gamma=\lambda \eta+\varepsilon$, where

η indicates the size of the unobservable variable and the informal economy; x is the observable external cause variables; ζ is the error term; ε is the random error terms, and λ is the parameter vector for the indicator variables.

According to Tedds, Giles (2000), the MIMIC Model allows the determination of the relative significance of causal variables using multiple causal variables affecting the unregistered economy. At the same time, it is also possible to add several different signs of the effectiveness of the informal economy at the same time. Zellner (1970), Goldberger (1972), Jöroskog and Goldberger (1975), Frey and Weck-Hanneman (1984), Teds (1998) and Giles (1999) are some of the researchers using the MIMIC model. Aigner et al. (1988) expanded MIMIC Model to Dynamic MIMIC (DYMIMIC) Model and applied the variables and ratings to USA model. Following this study, Helberger and Knepel (1988), Giles (1995), Loayza (1996), Giles (1999a), Salisu (2000), Eilat and Zinnes (2000), Cassar (2001), Giles and Tedds (2002), Dell'Anno and Schneider (2003), Chatterjee (2003), Schneider (2005) and Vuletin (2008) used the Dynamic MIMIC model in their studies.

III. INFORMAL ECONOMY ESTIMATES GLOBALLY

Informal Economy Estimates in Advanced Countries

In 1970/1990, the MIMIC model was used when estimating the informal economy in Western European countries (Schneider, 1997). Tedds (1999) used the MIMIC model approach to calculate the size of Canada's informal economy. MIMIC Model predicted the ordinal time path of the size of the informal economy for the 1976/1995 period. This model allows the use of different combinations of indicator and cause variables.

In 1999, Giles used the cash demand model with the MIMIC model to calculate the informal economy of New Zealand. The data obtained from the cash demand model was used to establish the time series index of the informal economic activities of the MIMIC model. In 2000, Giles and Tedds used the MIMIC model for unregistered economic results for Canada and New Zealand. The MIMIC model, in particular, highlighted the effects of goods and services defined in 1986 and 1991 on the informal economy in the countries concerned. Schneider estimated the unregistered economy in 1960/2005 using the dynamic MIMIC model with the cash model for OECD countries in 2000, 2004 and 2005.

Informal Economy Estimates in Transitional and Emerging Economies

In transition and emerging economies as much as half the labor force works in the informal sector. Informal firms congest infrastructure and other public services but they do not contribute the taxes needed to finance them. Better enforcement, more reasonable regulation, and economic growth can reduce informality. Schneider calculated the unregistered economy in 2002/2003 for the Eastern and Central European countries and the former Soviet Union countries using the MIMIC model with the cash model in 2005. Schneider again used the dynamic MIMIC model with cash demand to make an informal economy account for the 1999/2003 period,

taking into account 37 African countries, 21 Central and South American countries and 28 Asian countries in 2005. In 2005, Bajada and Schneider estimated the informal economy for 17 Asia-Pacific countries using Dynamic MIMIC and cash demand. A MIMIC model of the informal economy in Turkey was also carried out by Baldemir, Gökalp and Avci in 2004. The study concerned the 1980-2003 period. Two dependent variables and ten independent variables were used to measure the informal economy in Turkey. It has been found that 91% of the variance of the GNP variable and 90% of the variance of the productivity variable can be explained by the unregistered model. Interest rates, WPI, tax burden and tax revenues affect the informal economic activity positively when considering the independent variables calculated by Maximum Likelihood method. Changes in unemployment rates have an impact on the negative direction.

The study by Nchor, D. and Adamec, V. (2015) used the Multiple Indicators and Multiple Causes model (MIMIC), a variant of Simultaneous Equations Model (SEM) for the informal economy estimation in Kenya, Namibia, Ghana and Nigeria. The observed variables involved the size of government, indirect tax rates, total tax rates, business regulation, interest rate on deposits, unemployment rate, quality of public services, and GDP per capita. The indicator variables included labor participation rate in the official economy, the amount of cash held outside the banking system and growth in GDP per capita. This study showed the average level of underground economies in Kenya, Namibia, Ghana and Nigeria as 33.7%, 29.1%, 36% and 47%, respectively.

IV. MIMIC MODEL DESCRIPTION WITH THE ANALYSES AND THE RESULTS

The MIMIC model calculates the unregistered economy and the value obtained can be shown as a percentage of the gross domestic income. There are two main models-Structural (Xi) and Measurement Models-. It is called a structural model that shows the relationship between hidden variables and causal variables. The measurement model shows the relationship between informal economy and indicator variables.

Structural Model: $\eta = \gamma 11X1 + \gamma 12\ X2 + \gamma 13\ X3 + \gamma 14\ X4 + \gamma 15\ X5 + \gamma 16\ X6 + \zeta$

Measuring Model: $Y_1 = \lambda_{11}\ \eta + \varepsilon_1$

$Y_2 = \lambda_{21}\ \eta + \varepsilon_2$

where γ and λ are unknown parameter vectors. The averages of ζ and ε parameters are zero and have no relation with each other.

Table 1 MIMIC MODEL DATA (1977-2015)

Years	**1977**	**1978**	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**
REASON VARIABLES													
Unemployment Rate (%)[3]	2,90	5,04	4,04	3,29	2,94	2,44	2,15	2,69	2,23	2,38	1,79	1,32	1,10
Inflation Rate (%)	42,1	32,4	77,7	93,0	42,8	33,2	33,8	70,7	43,0	48,1	43,0	62,6	51,8
Per Capita Electricity Consumption Increase (%)	12	10	4	2	2	10	7	5	4	4	3	1	4
Total Tax Revenues (indirect + direct + fund) Ratio to GNP (%)	11	11	10	8	11	10	14	14	14	13	17	19	18
Self Employed Employees	4.621	5.434	4.802	5.020	5.850	5.192	4.948	4.699	4.765	5.767	6.165	7.681	6.938
INDICATOR VARIABLES													
Employment[3]	44.795	46.579	48.910	52.531	53.930	56.791	58.842	59.993	61.499	64.066	66.212	67.733	70.041
Real GNP Growth Rate (%)	4,1	5,8	4,4	0,9	-7,5	11,2	1,6	6,4	7,5	4,8	6,8	7,0	8,5
C/M2 (%)	17	20	24	25	25	27	25	27	25	19	16	19	16

Source: North Cyprus state Planning Organization

Cont. of Table 1

Years	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
REASON VARIABLES											
Unemployment Rate (%)[3]	8,03	9,50	6,83	5,26	6,39	6,74	7,97	6,25	6,74	7,44	8,76
Inflation Rate (%)	69,4	46,3	63,4	61,2	215,0	72,2	87,5	81,7	66,5	55,3	53,2
Per Capita Electricity Consumption Increase (%)	10	8	9	5	-3	1	3	-6	7	3	13
Total Tax Revenues (indirect + direct + fund) Ratio to GNP (%)	21	19	18	20	24	19	19	24	22	23	22
Self Employed Employees	6.335	7.532	7.271	7.997	8.002	7.188	7.499	7.231	7.706	7.436	7.102
INDICATOR VARIABLES											
Employment[3]	71.525	71.941	74.037	75.378	75.810	76.454	80.314	83.204	85.013	87.515	89.327
Real GNP Growth Rate (%)	5,7	-5,3	7,8	5,9	-3,7	2,6	2,9	4,1	6,0	7,4	-0,6
C/M2 (%)	14	10	11	12	15	15	10	12	8	10	12

Source: North Cyprus state Planning Organization

Cont. of Table 1

Years	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
REASON VARIABLES											
Unemployment Rate (%)[3]	10,88	10,81	9,28	10	8,20	9,40	9,40	9,80	12,40	11,90	9,7
Inflation Rate (%)	76,8	24,5	12,6	11,6	2,7	19,2	9,4	14,5	5,7	3,3	14,7
Per Capita Electricity Consumption Increase (%)	-4	0	1	13	5	6	5	5	-9,8	-4,8	26
Total Tax Revenues (indirect + direct + fund) Ratio to GNP (%)	19	19	26	31	26	25	30	29	26	29	28
Self Employed Employees	6.680	6.586	6.699	6.935	8.454	10.154	10.986	10.385	10.048	10.573	10.399
INDICATOR VARIABLES											
Employment[3]	90.366	93.114	98.860	86.914	85.583	91.815	89.787	91.223	91.550	93.498	97.103
Real GNP Growth Rate (%)	-5,4	6,9	11,4	15,4	13,5	13,2	1,5	-3,4	-5,7	3,6	3,3
C/M2 (%)	11	4	4	4	5	6	5	5	5	4,28	4,15

Source: North Cyprus State Planning Organization

Cont. of Table 1

Years	**2012**	**2013**	**2014**	**2015**
REASON VARIABLES				
Unemployment Rate (%)[3]	8,70	8,40	8,30	7,40
Inflation Rate (%)	3,6	10,2	6,5	7,8
Per Capita Electricity Consumption Increase (%)	4,13	-5,09	-5,06	3,00
Total Tax Revenues (indirect + direct + fund) Ratio to GNP (%)	28	28	29	27
Self Employed Employees	10.678	10.863	10.677	12.906
INDICATOR VARIABLES				
Employment[3]	96.539	97.868	103.149	112.811
Real GNP Growth Rate (%)	0,5	1,3	4,9	4,1
C/M2 (%)	4,01	3,98	4,24	4,01

Source: North Cyprus State Planning Organization

Table 2 MIMIC MODEL RESULTS (1977-2011)

Reason Variables	**Estimated Coefficients**
Unemployment Rate	λ1=0,185
	(2,41)
Inflation Rate	λ2=0,112
	(3,02)
Per Capita Electricity Consumption Increase	λ3=0,541
	(3,64)
Total Tax Revenues to GDP Ratio	λ6=0,453
	(3,58)
Self Employed Employees	λ9=0,241
	(2,21)
Indicator Variables	**Estimated Coefficients**
Employment	λ10=-0,388
	(-2,35)
Real GNP Growth Rate	λ11=-0,364
	(-2,62)
C/M2	λ5=0,167
	(2,19)
Note:	
t-statistics are in parentheses shows significance at the 95% confidence levels	
Test statistics	RMSE=0,0011
	AGFI=0,876
RMSE:Steiger's Root Mean Square Error of Approximation	
AGFI:Test of Adjusted Goodness of Fit Index	1:Perfect fit

The determinations in the above table were based on 1977-2015 data and were obtained using the Lisrel 8.7 Student Version. The data used is stable according to the ADF Unit root test results. When the MIMIC model equations are estimated, the second equation is normalized as the hidden variable of the dependent variable. Due to the reason, one of the elements of the vector of indications is restricted (Giles, 1999, Tedds, 2005). In this study, the C / M2 variable is also restricted and 1994 was taken into consideration.

When it is looked at the results obtained, it is clear that the signs of the indicators, which are both reason and cause, are in accordance with the theory. The increase in per capita electricity consumption and the ratio of total tax revenues are relatively larger on the informal economy than on other variables. On the other hand, there is a negative relationship between the growth rate of employment and real GNP and the informal economy.

The influences of signs take part in Schneider (2012), Cassar (2001)'s work in 162 countries.

As the unemployment rate increases, the number of people seeking legal employment may decrease. For this reason, the desire to work in informal sector increases. It can be seen from Table 2 that 70% of the variance of the time unemployment rate variable explained the unregistered economy. The inflation rate can enhance the tendency of the illegal markets to replace the market as the markets can unexpectedly encourage the prices of the products and services offered. The inflation rate also has a negative impact on the tax. 77% of the variance of the inflation rate reveals the informal economy. As per capita electricity consumption also grows, people prefer to resort to illegal roads, especially in countries with fossil fuel use due to high electricity costs. This preference also refers to the unregistered economy. The informal economy is explained by 32% of the variance of increase in per capita electricity consumption. As tax ratios increase, people become illegitimate economies in order not to pay taxes. In the study, 53% of the GNP ratio variance of total tax revenues accounts for the informal economy. As the number of self-employed workers rises, the desire to accurately declare the revenues they receive is diminishing. The reasons for this include the weight of the tax burden and the state's long procedures. Again, as Table 2 reveals, 83% of the variance of self-employed workers is affected by the informal economy. The coefficients of the independent variables forming the informal latent variable are calculated by using Maximum Likelihood method and they are interpreted by subtracting from the coefficients 1. As employment increases, people become more confident in the system and do not go to work in illegal ways. It is understood from Table 2 that 56% of the variance of the time employment variable is explained by the informal economy. The increase in the rate of real growth also provides the motivation of the people, the ability to do business and the confidence in the state. 56% of the variance of the real growth variable is revealed by the informal economy.

The increase in the ratio of circulating cash money to M2 also affects the motivation of obtaining money from illegal ways positively. A cash payday prevents unregistered activities from being recorded. When C / M2 variable is indicated, it is seen that 82% of the variance is explained by the informal economy.

Taking into account the fact that Schneider (2012) has conducted studies on OECD, developing and transiting countries in order to make informal economy comparisons between countries, the unregistered economic data of each of the countries is written for the 1999-2007 period. The values for NC have been added to the table 3 by the author in order to make the comparisons among the countries considered by Schneider. It is understood that NC informal economy resembles to the underground economies of Malaysia and Mexico.

Table 3 Informal Economy Data (1999-2007)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	**Country Average**
Australia	14,4	14,3	14,3	14,1	13,9	13,7	13,7	13,7	13,5	14
Bahamas	26,3	26,2	26,4	26,5	27	27,4	26,7	26,2	26,2	26,5
Belgium	22,7	22,2	22,1	22	22	21,8	21,8	21,4	21,3	21,9
Botswana	33,9	33,4	33,2	33,3	33	32,8	32,7	32,3	31,9	32,9
Brasilia	40,8	39,8	39,9	39,9	39,6	38,6	38,4	37,8	36,6	39
Canada	16,3	16	15,9	15,8	15,7	15,6	15,5	15,3	15,3	15,7
China	13,2	13,1	13	12,9	12,8	12,6	12,5	12,2	11,9	12,7
G.K.R.Y.	29,2	28,7	28,2	27,8	28,2	28,1	27,7	27,3	26,5	28
Czech Republic	19,3	19,1	18,9	18,8	18,7	18,4	17,8	17,3	17	18,4
Denmark	18,4	18	18	18	18	17,8	17,6	17	16,9	17,7
Egypt	35,5	35,1	35,2	35,7	35,4	35	34,8	34,1	33,1	34,9
Finland	18,4	18,1	17,9	17,8	17,7	17,6	17,4	17,1	17	17,7
France	15,7	15,2	15	15,1	15	14,9	14,8	14,8	14,7	15
Germany	16,4	16	15,9	16,1	16,3	16,1	16	15,6	15,3	16
Greece	28,5	28,7	28,2	28	27,4	27,1	26,9	26,4	26,5	27,5
Hong Kong	17	16,6	16,6	16,6	16,4	15,9	15,5	15	14,7	16
Iceland	16	15,9	15,8	16	15,9	15,5	15,1	15	15	15,6
India	32,2	32,1	22,8	22,6	22,3	22	21,7	21,2	20,7	22,2
Indonesia	19,7	19,4	19,4	19,3	19,1	18,8	18,6	18,3	17,9	18,9
Iran	19,1	18,9	19	18,7	18,2	17,9	18,1	17,7	17,3	18,3
Ireland	16,1	15,9	15,9	15,9	16	15,8	15,6	15,5	15,4	15,8
Israel	22,7	21,9	22,3	22,7	22,7	22,1	21,8	21,2	20,7	22
Italia	27,8	27,1	26,7	26,8	27	27	27,1	26,9	26,8	27
Japan	11,4	11,2	11,2	11,3	11,2	10,9	10,7	10,4	10,3	11
Kazakhstan	43,8	43,2	42,5	42	41,1	4,06	39,8	38,9	38,4	41,1
Korea	28,3	27,5	27,3	26,9	26,8	26,5	26,3	25,9	25,6	26,8
Kyrgyzstan	41,4	41,2	40,8	41,4	40,5	39,8	40,1	39,8	38,8	40,4
Luxemburg	10	9,8	9,8	9,8	9,8	9,8	9,7	9,6	9,4	9,7
Macao	13,3	13,1	13	12,9	12,5	12,1	11,9	11,7	11,1	12,4
Macedonia	39	38,2	39,1	38,9	38,4	37,4	36,9	36	34,9	37,6
Malaysia	***32,2***	***31,1***	***31,6***	***31,5***	***31,2***	***30,7***	***30,4***	***30***	***29,6***	***30,9***
Mexico	***30,8***	***30,1***	***30,3***	***30,4***	***30,5***	***30,1***	***29,9***	***29,2***	***28,8***	***30***
New Zealand	13	12,8	12,6	12,4	12,2	12	12,1	12,1	12	12,4
North Cyprus	**31,8**	**31,5**	**31,7**	**31,6**	**30,8**	**30,6**	**29,7**	**29,3**	**28,8**	**30,6**
Oman	19,1	18,9	18,5	18,5	18,4	18,3	18	17,6	-	18,4
Pakistan	37	36,8	37	36,8	36,2	35,5	34,9	33,8	33,6	35,7
Philippines	43,8	43,3	43	42,5	42	41,6	40,1	39,5	38,3	41,6
Russian Fed.	47	46,1	45,5	44,5	43,6	43	42,4	41,7	40,6	43,8
Saudi Arabia	18,7	18,4	18,7	19,2	18,3	17,7	17,4	17,4	16,8	18,1
Singapore	13,3	13,1	13,3	13,3	13,1	12,8	12,7	12,4	12,2	12,9
South Africa	28,4	28,4	28,4	28	27,8	27,1	26,5	26	25,2	27,3
Spain	23	22,7	22,4	22,4	22,4	22,5	22,4	22,4	22,2	22,5
Switzerland	8,8	8,6	8,6	8,6	8,8	8,6	8,5	8,3	8,1	8,5
Syria	19,3	19,3	19,2	19,1	19,3	19,1	19	18,7	18,5	19,1
Taiwan	25,7	25,4	25,7	25,4	25,2	24,7	24,5	24,2	23,9	25
Thailand	53,4	52,6	52,4	51,5	50,2	49,6	49	48,5	48,2	50,6
Trinidad and Tobago	34,7	34,4	34,3	34,4	33,4	33,1	32,9	31,9	31,5	33,4
Tunisia	38,7	38,4	37,8	37,8	37,4	36,9	36,7	35,9	35,4	37,2
Turkey	32,7	32,1	32,8	32,4	31,8	31	30	29,5	29,1	31,3
United Arab Emirates	26,3	26,4	27	27,4	26,3	25,4	24,8	23,5	-	25,9
United Kingdom	12,8	12,7	12,6	12,6	12,5	12,4	12,4	12,3	12,2	12,5

Cont. of Table 3

United States	8,8	8,7	8,8	8,8	8,7	8,6	8,5	8,4	8,4	8,6
Venezuela	33,8	33,6	33,5	35,5	36,9	34,9	33,5	32	30,9	33,8
Vietnam	15,8	15,6	15,5	15,3	15,2	15,1	14,7	14,6	14,4	15,1

Calculating the unregistered economy values for the NC in 1990-2015, the following table is obtained.

Table 4 NC Informal Economy Data and Size of Tax Loss (1990-2015)

Years	1990	1991	1992	1993	1994	1995	1996	1997	1998
Informal Economy*	28,7	28,5	29,0	29,4	31	31,3	31,4	32,1	32,2
Tax Loss**	6,0	5,4	5,2	5,9	7,4	5,9	6,0	7,7	7,1

Years	1999	2000	2001	2002	2003	2004	2005	2006	2007
Informal Economy*	31,8	31,5	31,7	31,6	30,8	30,6	29,7	29,3	28,8
Tax Loss**	7,3	6,9	6,0	6,0	8,0	9,5	7,7	7,3	8,6

Years	2008	2009	2010	2011	2012	2013	2014	2015
Informal Economy*	28,5	28,4	28,6	28,9	28,7	28,5	28,4	28,3
Tax Loss**	8,3	7,4	8,3	8,1	7.9	8,1	8,3	8,1

where * ratio of the size of the informal economy and tax loss to GNP ;

** Tax Loss = Unregistered Economy (Total Tax Revenues / GNP)

From at the above table, it is understood that the economy in our country is considerably informal economy. Informal Economy in North Cyprus is closely following the informal economy in transition economies therefore the system should be questioned for political and economic construction. The change of the informal economy in countries can be read from the graphs drawn by the results obtained in North Cyprus and many countries of the world using the informal economy data of 1999-2007 periods. It can be seen from these graphs that many countries have succeeded in decreasing the value of the informal economy over the years.

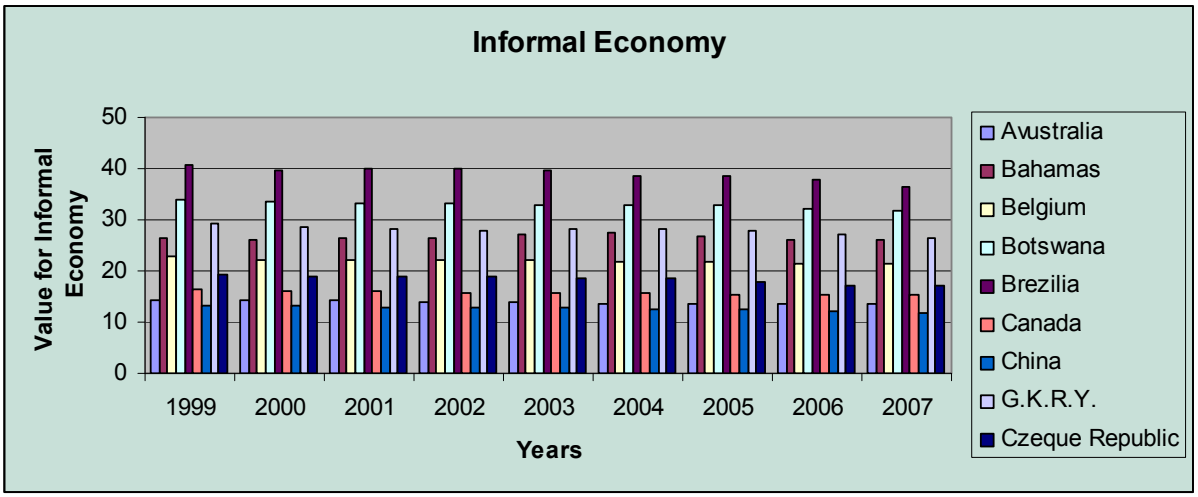

Figure 1: Informal Economy (1999-2007)

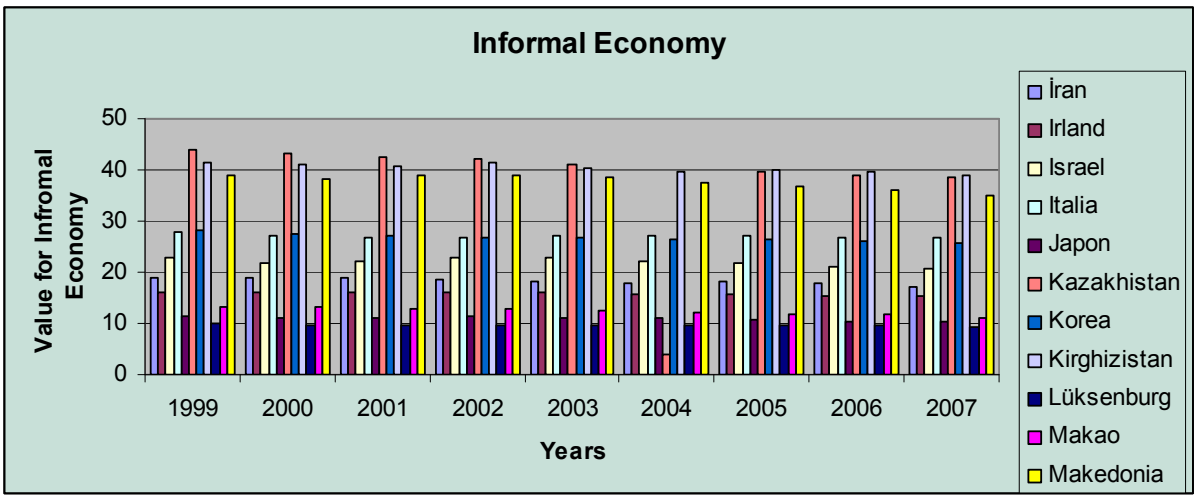

Figure 2: Informal Economy (1999-2007)

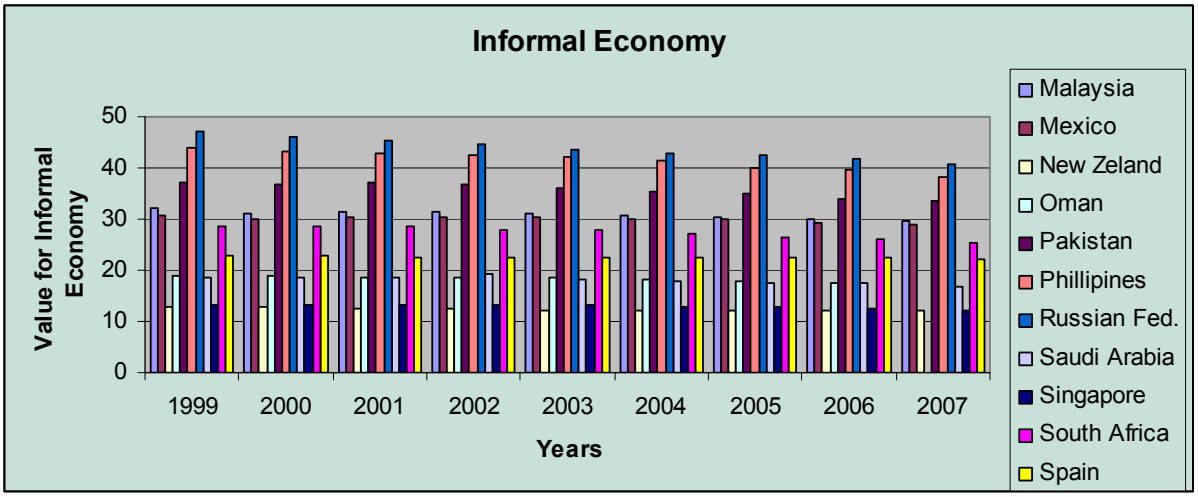

Figure 3: Informal Economy (1999-2007)

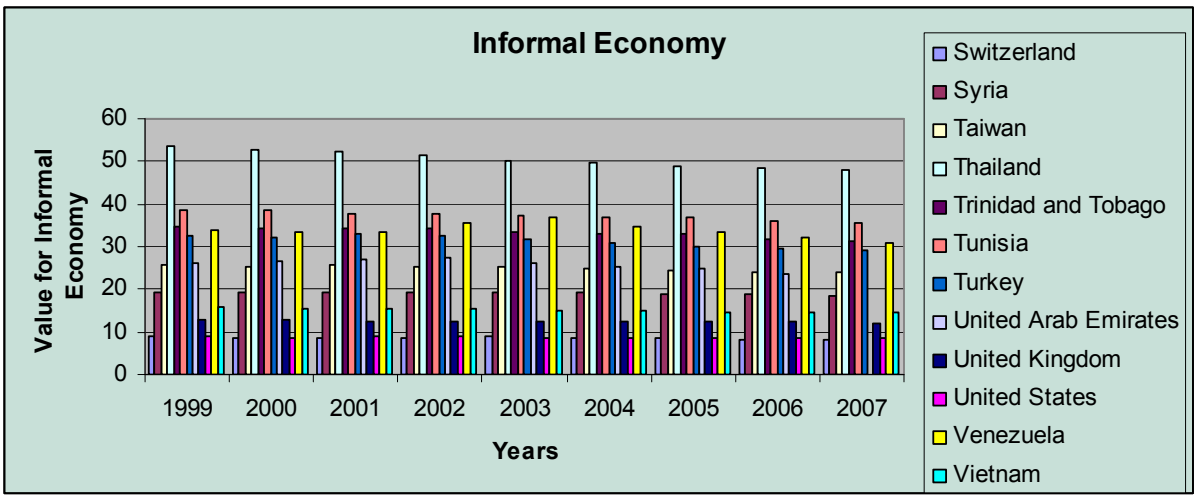

Figure 4: Informal Economy (1999-2007)

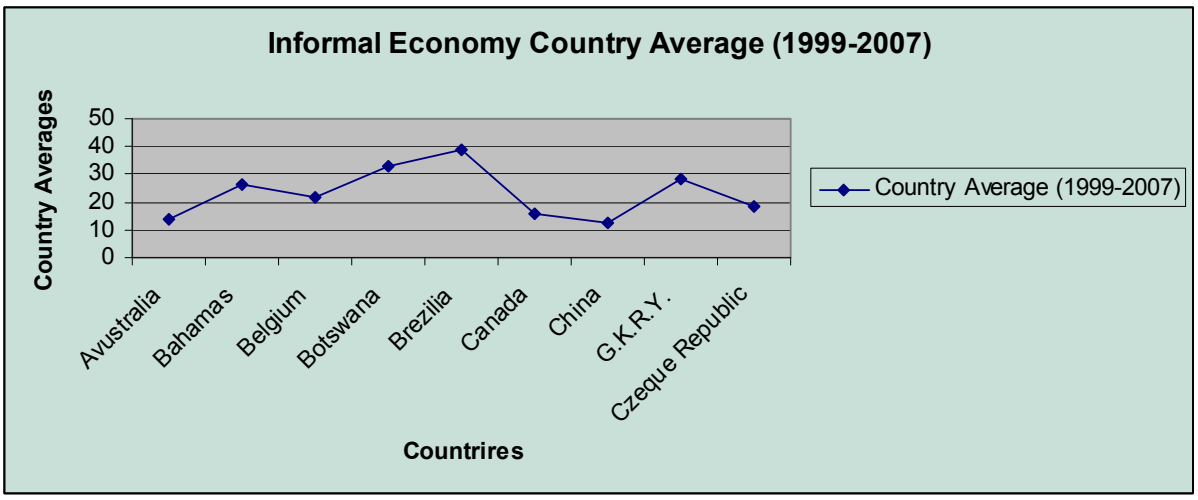

Figure 5: Informal Economy Country Average (1999-2007)

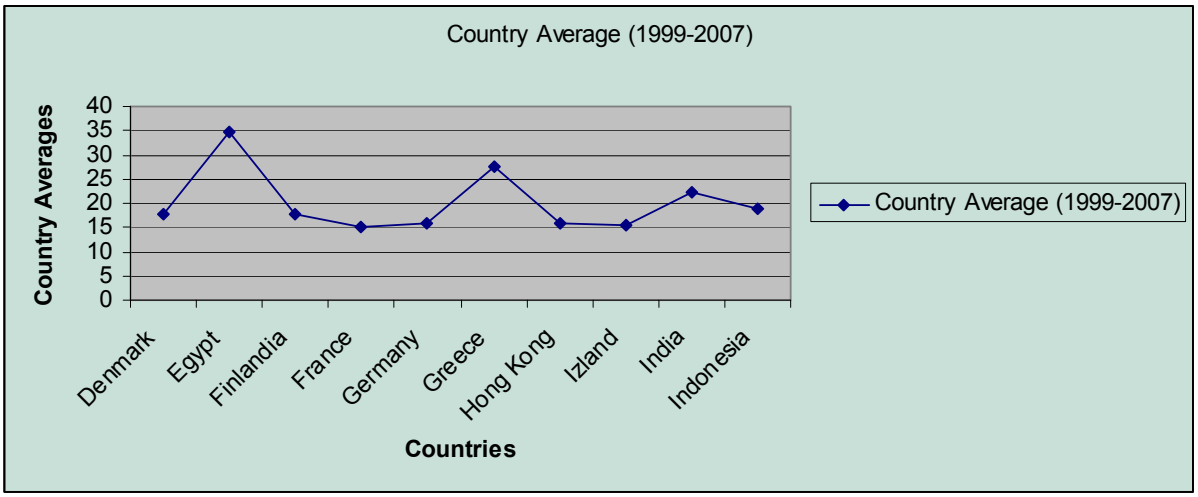

Figure 6: Informal Economy Country Average (1999-2007)

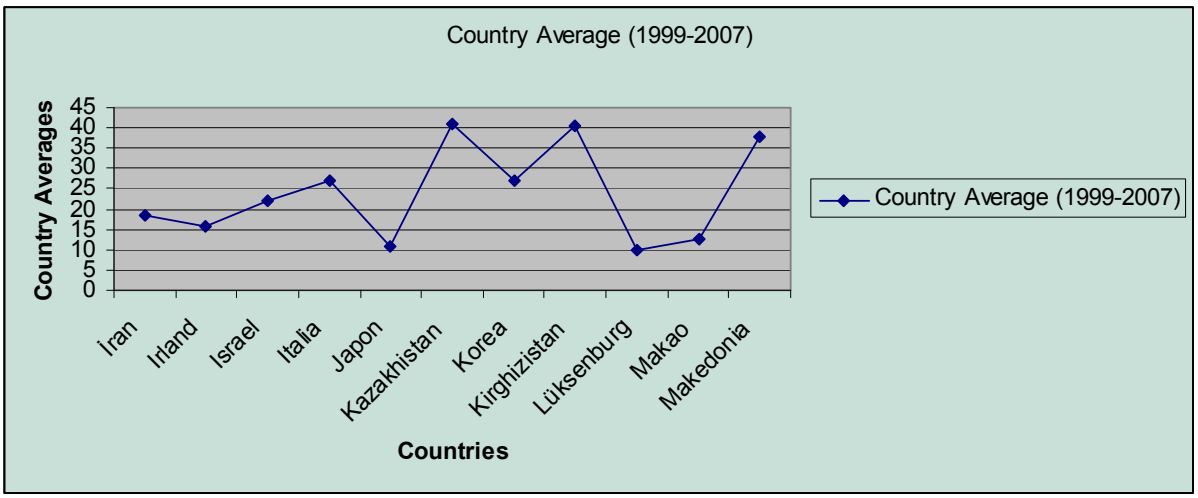

Figure 7: Informal Economy Country Average (1999-2007)

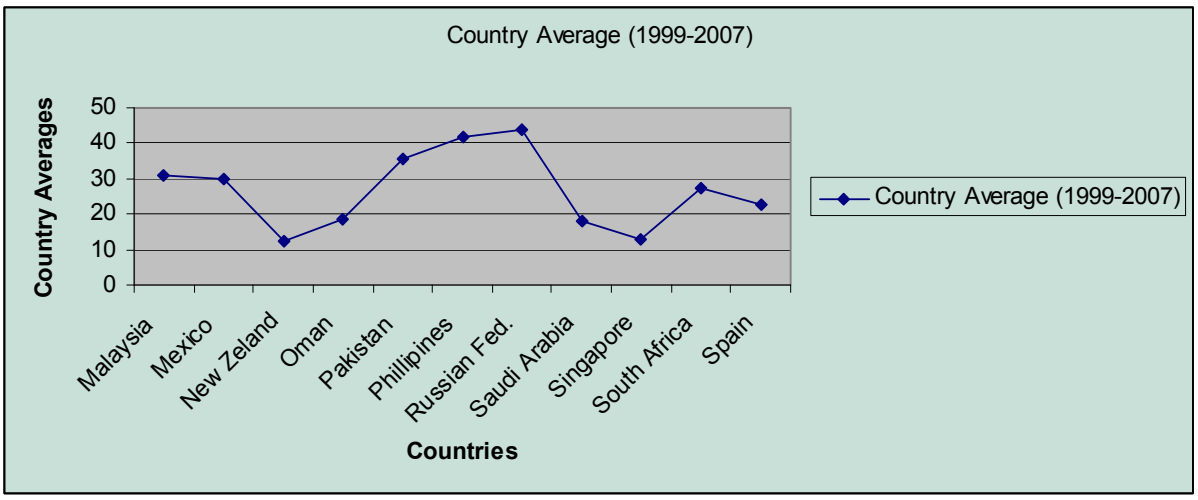

Figure 8: Informal Economy Country Average (1999-2007)

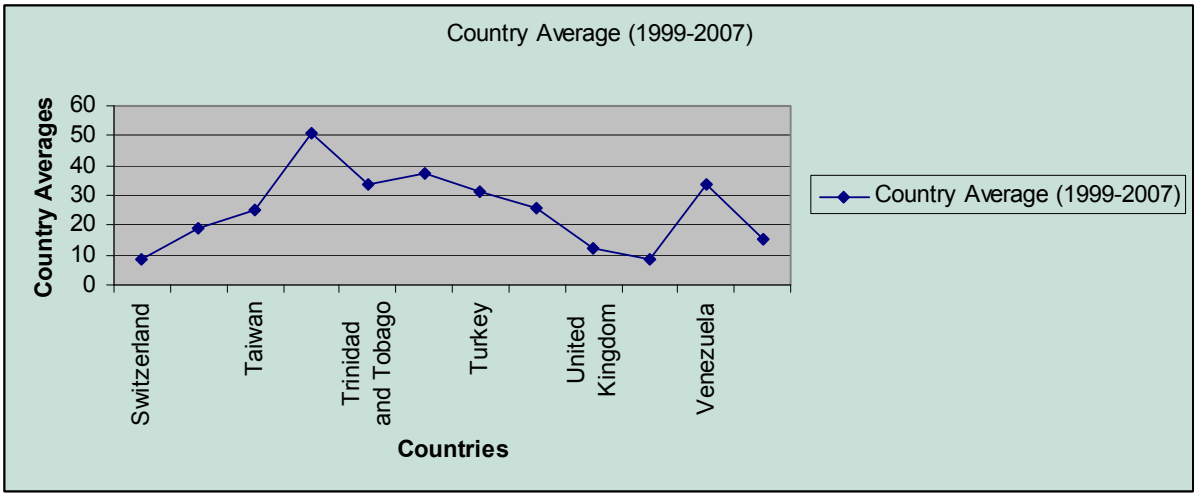

Figure 9: Informal Economy Country Average (1999-2007)

V. CONCLUSION AND RECOMMENDATIONS

Weak and Strong Sides of Income-Expenditure Method and MIMIC Models

Whether or not the information on the subject of questioning the reliability of the informal economy measured through questionnaires is correct. Company owners, who want to keep their credibility grades high in the banks, seem to be more willing to make a more accurate statement of their income and expenses. With the GNP approach, it is not possible to rely on the informal economy figures found in this method because statisticians are responsible for the differences between the three different calculations (Ercan, 2006). Especially in countries that see foreign exchange and gold as a means of saving, the calculation of the informal economy size with the GNP approach creates an even more insecure environment (Us, 2004).

The MIMIC Model approach has been the basis for a number of studies because it enables the use of a significant number of causal and indicator variables (Schneider, 2000, 2004, 2005).

Applicability of MIMIC Model to the Island Economy

Although the income-expenditure approach is evaluated on different outcomes, even though Gabor's unofficial economics study in Hungary in 1989 reflects almost the same situation in NC and the similarities (in the private sector, small scale, production and service sector etc.) the fact that different values emerged by statisticians are perceived as a statistical error and go to remedy, reduces the confidence in the method of income-expenditure to be considered. In NC, it is looked after in a high position as a means of saving and betting. In this sense, using the methods of calculating GDP as an informal economy measure is not considered correct (Temel, Şimşek ve Yazıcı, 1994). Another point is that the deviations in the value of the informal

economy measured by the GNP approach are possible if too much cushioning savings exist. Moreover, it is thought that the income-expenditure approach can not be a correct approach in terms of NC because the seasons in the tourism sector, which is considered as one of the economic wheels in North Cyprus, are very much affected and the sector where the informal economy is concentrated. Since the MIMIC Model takes into account the "hidden variable" dimension, its usefulness in closed economies is very good.

Suggested Models

Because of being an island, Sookram and Watson (2007) model can be used for employers. The aim of the study is to reveal that small transmissions lead to unregistered economies. Different approaches are suitable for making calculations. The best income-expenditure method that can be used to calculate the informal economy is the work of Pissarides and Weber (1989) due to the details given in the literature. The dynamic MIMIC model can be said to be one of the most suitable models for calculating the island unregistered economy according to the literature survey and the obtained data interpretations.

VI. REFERENCES

1. Aigner, D. J., Schneider, F. and Ghosh D., (1988), "Me and my shadow: estimating the size of the U.S. hidden economy from time series data", dynamic Econometric Modeling, Proceedings of the Third International Symposium in Economic Theory and Econometrics, edited by Barnett, W.Berndt, E. And White, H., Cambridge University Press, pp.297-334
2. Breusch, T., (2005), Estimating the Underground Economy Using MIMIC Models, 129.3.20.41/eps/em/papers/0507/0507003.pdf
3. Cassar, A., (2001), "An index of the underground economy in Malta", Bank of Valetta Review, 23, pp.44-62
4. Dell'Anno, R., (2003), "Estimating the shadow economy in Italy: a structural equation approach", University of Aarhus, Department of Economics, DK. Working paper 2003-7
5. Eilat, Y. and Zinnes, C., (2000), "The evolution of the shadow economy in transition countries: Consequences for economic growth and donor assistance", CAER II discussion paper no 83, Harvard Institute for International Development
6. Engström, P. and Holmlund, B., (2007), "Tax Evasion and Self-Employment in a High-Tax country: Evidence from Sweden", Uppsala University, Working Paper Series
7. Ercan, M. (2006), Kayıtdışı Ekonomi ve Hızlı Tüketim Malları Sektörü, Nurol Matbaacılık:Ankara
8. Frey, B. And Weck-Hannemman, H., (1984), "The hidden economy as an 'unobservable' variable", European Economic Review, 26, 1, pp.33-53
9. Gerxhani, K. (2004), "The informal sector in developed and less developed countries: a literature survey", Public Choice, 120(3-4): 267-300
10. Giles, D.E.A., (1995), "Measuring the size of the hidden economy and the tax gap in New Zealand:an econometric analysis", Working Paper No. 5a, Working Paper on Monitoring the Health of the Tax System, Inland Revenue Department, Wellington
11. Giles, D.E.A., (1999a), "Measuring the hidden Economy:Implications for Econometric Modeling", The Economic Journal, 109, 46, pp.370-380
12. Giles, D.E.A. and Tedds, L.M., (2002), "Taxes and the Canadian Underground Economy", Canadian Tax Paper n. 106, Canadian Tax Foundation, Toronto
13. Goldberger, Arthur S., (1972), Structural Equation Methods in the Social Sciences, North- Holland: Amsterdam
14. Gutmann, Peter M., (1977), "The subterranean Economy", Financial Analysts Journal, 34, pp. 24-27
15. Helberger, C. And Knepel, H. (1988), "How big is the shadow economy? A re-analysis of the unobserved-variable approach of B.S. Frey and H. Weck-Hannemann", European Economic Review, 32, pp 965-976
16. Jöreskog, K. and Goldberger, A. S., (1975), "Estimation of a model with multiple indicators and multiple causes of a single latent variables", Journal of the American Statistical Association, 70, pp.631-639
17. Kim, B., Gibson, J. And Chung, C., (2011), "Using Panel Data to Exactly Estimate Income Under-Reporting by the Self-Employed", Seoul National University, working Paper Series
18. Krichevskiy, D., (2010), "a Consumption-based measure of the monetary rewards to entrepreneurship", Florida International University, Miami FL 33199
19. Lee, C. F., (2005), Determinants of Capital Structure Choice: A Structural Equation Approach, www.business.rutgers.edu/download.aspx?id=1029
20. Loayza, N. V., (1996), "The Economics of the Informal Sector: A Simple Model and some empirical Evidence from Latin america", Carnegie-Rochester Conference Series on Public Policy, 45, pp. 129-162
21. Loayza, N., A.M. Oviedo, and L. Servén (2005) , "The impact of regulation on growth and informality: cross-country evidence",Policy Research Working Paper No. 3623, The World Bank, Washington, D.C.
22. Nchor, D. and Adamec, V. (2015), "Unofficial Economy Estimation by the Mimic Model: The Case of Kenya, Namibia, Ghana and Nigeria", Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis, 63(6): 2043–2049
23. Pissarides C. A. And Weber, G., (1989), "An Expenditure-Based Estimate of Britain's Black Economy", Journal of Public Economics, (39),17-32
24. Prokhorov, A. B., (2001), The World Unobserved Economy:Definition, Measurement, and Optimality Considerations, http://www.msu.edu/~prokhorov/a.pdf
25. Salisu, M., (2000), "Corruption in Nigeria", Lancaster University Management School, UK, Working Paper 2000/006
26. Sarılı, M. Ali, (2002), "Türkiye'de Kayıtdışı Ekonominin Boyutları, Nedenleri, etkileri ve Alınması Gereken Tedbirler", Bankacılar Dergisi
27. Schneider, F. (2000), The Growth of the Shadow Economy in the OECD:Some preliminary Explanations, Journal of International Affairs, 53(2)
28. Schneider, F. (2012),"The Shadow Economy and Work in the Shadow:What do we (not) know? At the website of studien/pfuschneu/2012/LabForce_survey_2012.doc
29. Tedds, L. M., (1999), Measuring the size of the Hidden Economy in Canada: A Latent Variable/MIMIC Model Approach, home.cc.umanitobe.ca/~tedds/StatCan_1999.pdf
30. Tedds, L., Giles, D., (2000), "Modelling the Underground Economies in Canada and New Zealand:A Comparative Analysis", Econometrics Working Paper

31. Tedds, L. M., (2005), "Nonparametric Expenditure- Based Estimation of Income Under-reporting and the Underground Economy", McMaster University, Working Paper Series
32. Temel, A., A. Şimşek ve K. Yazıcı (1994), "Kayıtdışı Ekonomi Tanımı, Tespit Yöntemleri ve Turkiye Ekonomisindeki Büyüklüğü", Ekonomik Modeller ve Stratejik Araştırmalar Genel Müdürlüğü
33. US Vuslat, (2004), Kayıtdışı Ekonomi Tahmini Yöntemi:Türkiye Örneği, Türkiye Ekonomi Kurumu Tartışma Metni
34. Zellner, Arnold, (1970), "Estimation of Regression Relationships Containing Unobservable Variables", International Economic Review 11, 441-454